THE SCIENCE OF FEELING GOOD & FEELING BAD WITH ALCOHOL

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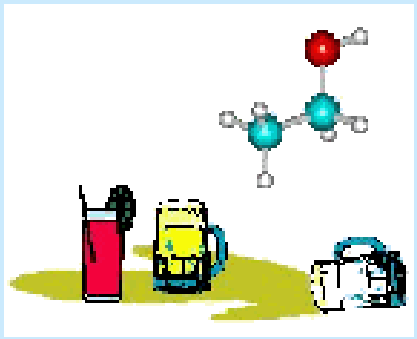
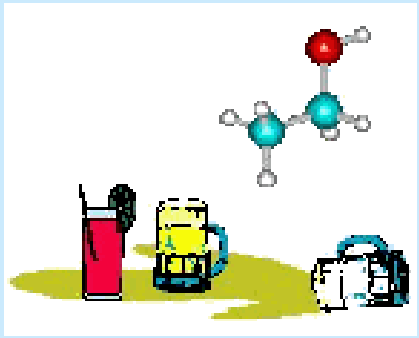
8-9 pm
Thursday, October 22, 1998
Napier Hall, room 201





Alcohol Awareness Week
Lecture Series Sponsored by
Sigma Chi Fraternity

Behavioral Manifestations of Alcohol Ingestion

- With 1 to 2 drinks (.01-.05 g/dL BAC) -- euphoria and perceived reduction in anxiety
- With 3 to 5 drinks (.06-.10 g/dL BAC) -- judgement and motor coordination impaired, sometimes increased aggression
- With 10 to 13 drinks (.20-.25 g/dL BAC) -- sedation
- With 0.30 g/dL BAC -- memory impairment and loss of consciousness
- With 0.40 to .50 g/dL BAC -- depressed respiration , coma, death

*BACs for inexperienced user

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 89

Alcohol Affects Neuro-transmitter Function in the Brain

- Increases **Dopamine** concentration
- Decreases **Serotonin** nerotransmission
- Stimulates **Opiate Neuropeptide** Release
- Potentiates **GABA** receptor function
- Inhibits **Glutamate** receptor function

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 93-94

Affect on Dopamine, Seratonin, and Endogenous Opiates (>.01-.05 BAC)

- **Dopamine** simulates pleasure centers and functions in positive reinforcement
  - alcohol increases Dopamine concentrations in nucleus acumbens and other reward centers
- **Serotonin** functions as a behavioral inhibitor
  - alcohol decreases serotonin activity leading to increased impulsivity and aggressiveness
- **Endorphins and Enkephalins** are natural neural peptides that bind to opiate receptors and produce euphoric effects.
  - Endorphins and Enkephalins are released by the brain when exposed to alcohol
  - Euphoria seems to stimulate further drinking

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 88-94

Affect on GABA function (~>.06 BAC)

- GABA is major inhibitory neurotransmitter
- Alcohol Potentiates GABA receptor function
- GABA receptor is site of action of
  - sedative/anesthetic barbiturate, pentobarbitol
  - sedative/anxiolytic benzodiazipines
- Major Site of Affects include:
  - medial septal nucleus -- controls "arousal state"
  - Purkinje neurons in cerebellar cortex -- controls sensory and motor activity
- RO 15-4513 overcomes motor impairment

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 93-94

Affect on Glutamate Function (~>.2 BAC)

- Glutamate is major excitatory neurotransmitter
- Inhibits glutamate receptor function
- Impaired Glutamate Receptor Function Causes:
  - cognitive impairment and amnesia
  - inability to learn new information
- Alcohol parallels action of PCP or "angel dust"

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 93-94

Effect of Chronic Use

- Tolerance
  - Functional Tolerance -- changes in GABA receptors
  - Acute Tolerance -- occurs within a drinking session
  - Metabolic Tolerance
  - ...
- Withdrawal
  - increased Anxiety within hours -- GABA
  - seizures -- GABA
- Dependence
  - changes in Dopamine and Serotonin function appear to be long lasting

SOURCE: *Eighth Special Report to the US Congress on Alcohol and Health*, US Dept. of HHS (1993), p 94-100
Alcohol Alert, 26, National Institute on Alcohol Abuse and Alcoholism, (1995)

Alcohol

CH_3-CH_2-OH

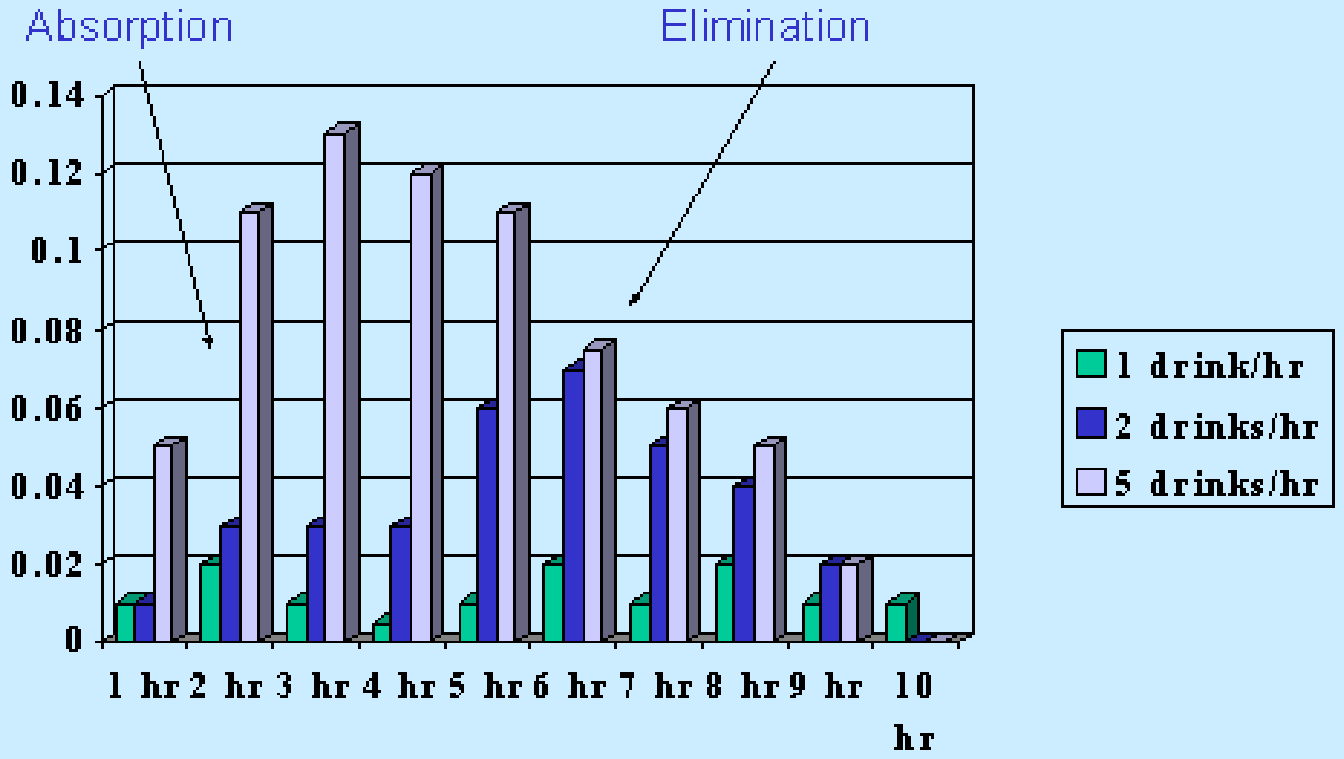
Dose

- 12 oz Beer 3.6-4.0% alcohol contains 13-17g alcohol
- 4 oz Wine 12-14% alcohol contains 14-17g alcohol
- 1-1.5 oz 86 proof Whiskey contains 13-19g alcohol

Chemical Solubility

- Completely soluble in water
- Somewhat soluble in fat
- 30x more soluble in water that in fat

Effect of Rate of Ingestion of 10 Drinks on BAC (following a light meal)

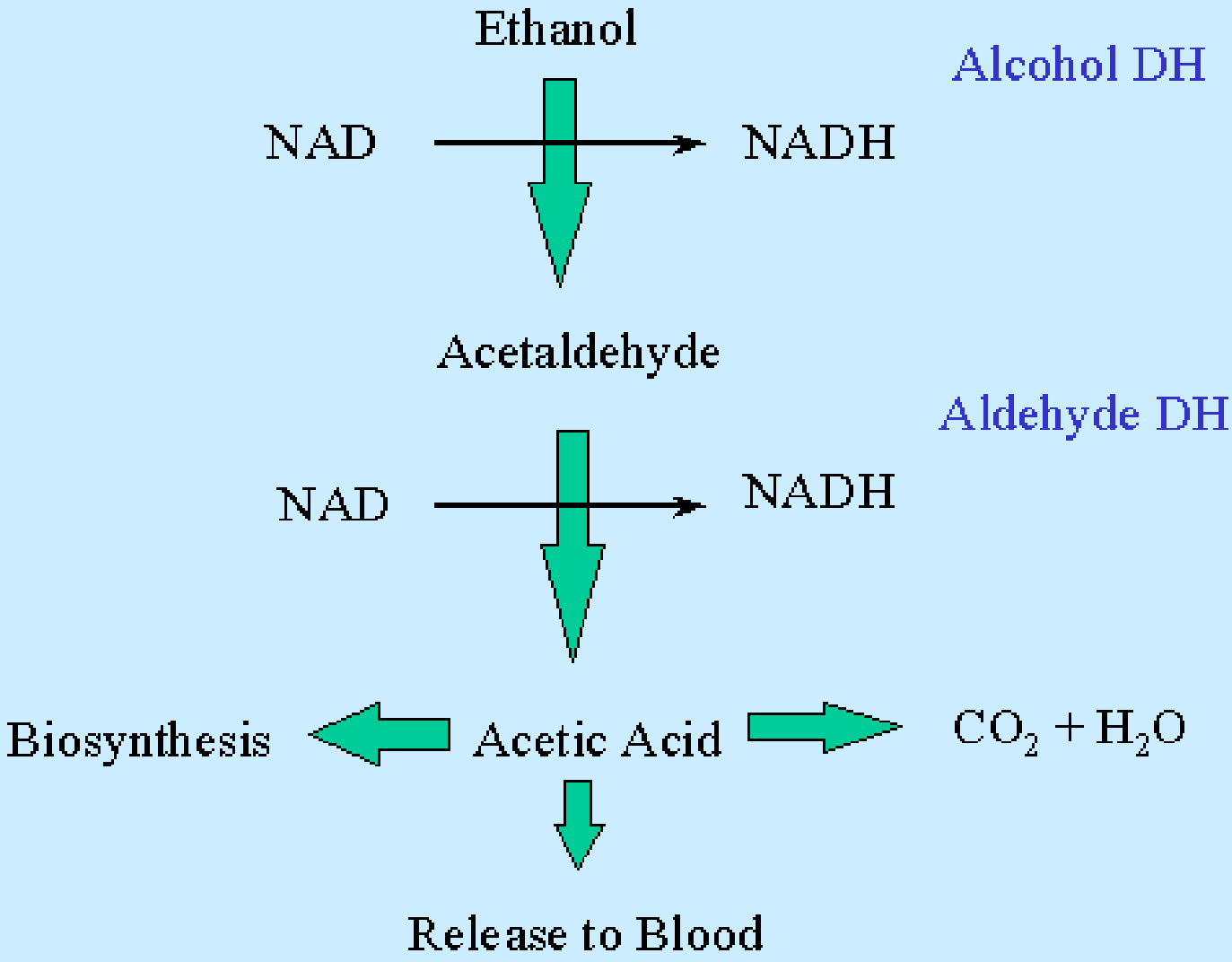


SOURCE: Estes and Heinemann, *Alcoholism: Development, Consequences and Interventions*, C. V. Mosby Co. (1986) p 95

Absorption

- Rate of absorption is dependent on:
  - concentration gradient between gut and blood
  - surface area of contact
  - degree of vascularization
- Effect of Food on Absorption
  - food dilutes alcohol in the digestive system
  - fatty foods are slow to digest and slow to move from the stomach to the small intestine

Major Pathway for Alcohol Metabolism



Metabolic Differences Between Men and Women

- Women are smaller than men
- Women have lower total body water content than men of comparable size
- Gastric ADH lower in women
  - virtually nonexistent in alcoholic women
- Fluctuations in gonadal hormone levels during the menstrual cycle may affect the rate of alcohol metabolism

SOURCE: Alcohol Alert #10, NIAAA (1990)

Differences in Health Risks Between Men and Women

- Risk of Liver damage becomes significant when alcohol consumption exceeds
  - 6.2oz/day for men
  - 1.55oz/day for women
- Menstrual disorders
  - painful irregular menstruation
  - decreased fertility
- Increased risk for breast cancer with 1 oz daily consumption
- Female alcoholics have death rates 50 to 100 percent higher than those of male alcoholics

SOURCE: Alcohol Alert #10, NIAAA (1990) and Alcohol and Health HHS (1993) pp165-185

Metabolic Differences Between Ethnic Groups

- Isoenzymes in Alcohol DH (ADH)
  - Beta1 in Caucasian has Km 0.00023 g/dL
  - Beta2 in Asian has Km 0.0043 g/dL
  - Beta3 in 15% African Amer. has Km .165 g/dL
- 50% Asian have inactive mito. Aldehyde DH (ALDH) resulting in facial flushing, palpitations, dizziness, and nausea

Did You Know That...

- drinking and driving is the #1 killer for those 17-24?
- 30% of college failure is alcohol related?
- 75-90% of campus rapes involve alcohol?
- college students consume 430 million gallons per year (enough to fill an Olympic swimming pool at each school)?

Yet...

- 83% of HWS students NEVER drive in an alcohol impaired condition.
- 71% of HWS students NEVER drink to an extent that causes inefficiency in academic work.
- Three-quarters of HWS students NEVER injure themselves or others as a result of drinking!
- Two-thirds of all students at HWS drink only one-quarter of all the alcohol that is consumed by students here.